CLAIMS

We Claim:

1. A method of manufacturing an integrated heat spreader, comprising:

exposing a plurality of integrated heat spreaders to heat;

performing a dimensional analysis on each of the plurality of integrated heat spreaders to determine any deformation of a shape of the integrated heat spreader;

altering the shape of the plurality of integrated heat spreaders to minimize for the deformation in the shape of the plurality of heat spreaders as determined by the dimensional analysis.

2. The method recited in claim 1, wherein exposing a plurality of integrated heat spreaders to a heat further comprises:

building the plurality of integrated heat spreaders so that they have at least one flat surface area upon which a heat sink may be placed.

3. The method recited in claim 2, wherein building the plurality of integrated heat spreaders so that they have at least one flat surface area upon which a heat sink may be placed further comprises:

building a plurality of series of the plurality of integrated heat spreaders wherein a series of the plurality of series comprises at least one integrated heat spreader having a shape to compensate for deformations seen by the dimensional

analysis which is different from a shape of an integrated heat spreader from another series of the plurality of series.

4. The method recited in claim 3, wherein altering the shape of the plurality of integrated heat spreaders to compensate for any deformation in the shape of the plurality of heat spreaders seen by the dimensional analysis further comprises:

selecting the series of the plurality of series of the plurality of integrated heat spreaders having the at least one surface area remains flat when exposed to the heat generated by a die.

5. The method recited in claim 4, further comprising:

determining if any hotspots are generated by the die; and

modifying a local shape of the plurality of integrated heat spreaders to reduce a gap between the integrated heat spreader and the heat sink.

6. A method of manufacturing an integrated heat spreader, comprising:

generating a finite element model of a package having a substrate connected to a die connected to the integrated heat spreader connected to a heat sink;

executing the finite element model to generate the integrated heat spreader with a shape having deformations;

altering the shape of the integrated heat spreader to compensate for the deformations;

executing the finite element model using the integrated heat spreader having an altered shape to compensate for the deformations; and

repeating the altering of the shape of the integrated heat spreader to compensate for the deformations and execution of the finite element model until no further deformations exist.

7. The method recited in claim 6, wherein the generating a finite element model of a package further comprises:

dividing the substrate, the die, the integrated heat spreader, and the heat sink into a plurality of elements having a certain spatial coordinate and connected to other elements of the plurality of elements.

8. The method recited in claim 7, further comprising:

associating properties with the each of the elements of the plurality of elements, wherein the properties comprise mechanical and thermal properties, wherein thermal properties comprise coefficients of thermal expansion.

9. The method recited in claim 8, wherein the deformations are due to the physical manipulation of the integrated heat spreader or heat absorption by the integrated heat spreader generated by the die.

10. The method recited in claim 9, further comprising:

identifying hotspots on the die;

determining an associated elements on the integrated heat spreader for the hotspots on the die; and

modifying the heat spreader geometry to decrease local thermal resistance in the associated elements on the integrated heat spreader.

11. A computer program embodied on a computer readable medium and executable by a computer for manufacturing an integrated heat spreader, comprising:

exposing a plurality of integrated heat spreaders to a elevated temperature;

performing a dimensional analysis on each of the plurality of integrated heat spreaders to determine a shape of the integrated heat spreader;

altering the shape of the plurality of integrated heat spreaders to compensate for any deformation in the shape of the plurality of heat spreaders seen by the dimensional analysis.

12. The computer program recited in claim 11, wherein exposing a plurality of integrated heat spreaders to a elevated temperatures further comprises:

building the plurality of integrated heat spreaders so that they have at least one flat surface area upon which a heat sink may be placed.

13. The computer program recited in claim 12, wherein building the plurality of integrated heat spreaders so that they have at least one flat surface area upon which a heat sink may be placed further comprises:

building a plurality of series of the plurality of integrated heat spreaders wherein a series of the plurality of series comprises at least one integrated heat spreader having a shape to compensate for deformations seen by the dimensional analysis which is different from a shape of an integrated heat spreader from another series of the plurality of series.

14. The computer program recited in claim 13, wherein altering the shape of the plurality of integrated heat spreaders to compensate for any deformation in the shape of the plurality of heat spreaders seen by the dimensional analysis further comprises:

selecting the series of the plurality of series of the plurality of integrated heat spreaders having the at least one surface area remains flat when exposed to the heat generated by a die.

15. The computer program recited in claim 14, further comprising:

determining if any hotspots are generated by the die; and

modifying the local geometry of the integrated heat spreaders to reduce a gap between the integrated heat spreader and the heat sink.

16. A computer program embodied on a computer readable medium and executable by a computer for manufacturing an integrated heat spreader, comprising:

generating a finite element model of a package having a substrate connected to a die connected to the integrated heat spreader connected to a heat sink;

executing the finite element model to generate the integrated heat spreader with a shape having deformations;

altering the shape of the integrated heat spreader to compensate for the deformations;

executing the finite element model using the integrated heat spreader having an altered shape to compensate for the deformations; and

repeating the altering of the shape of the integrated heat spreader to compensate for the deformations and execution of the finite element model until no further deformations exist.

17. The computer program recited in claim 16, wherein the generating a finite element model of a package further comprises:

dividing the substrate, the die, the integrated heat spreader, and the heat sink into a plurality of elements having a certain spatial coordinate and connected to other elements of the plurality of elements.

18. The computer program recited in claim 17, further comprising:

associating properties with the each of the elements of the plurality of elements, wherein the properties comprise coefficients of thermal expansion.

19. The computer program recited in claim 18, wherein the deformations are due to (a) the physical manipulation of the integrated heat spreader (b) heat absorption by the integrated heat spreader generated by the die (c) non isothermal processing conditions for the package, coupled with differing coefficients of thermal expansion for the package materials.

20. The computer program recited in claim 19, further comprising:

identifying hotspots on the die;

determining an associated elements on the integrated heat spreader for the hotspots on the die; and

modifying the local geometry of the associative elements on the integrated heat spreader in order to reduce local thermal resistance.

21. A package, comprising:

a die that generates heat; and

an integrated heat spreader connected to the die to absorb the heat generated by the die and change the shape of at least one surface of the integrated heat spreader, wherein the at least one surface of the integrated heat spreader becomes approximately flat.

22. The package recited in claim 21, further comprising:

a heat sink connected to the at least one surface of the integrated heat spreader that is approximately flat to dissipate heat from the integrated heat spreader to ambient air.

23. The package recited in claim 22, wherein the at least one surface of the integrated heat spreader connected to the heat sink only becomes flat when absorbing heat.

24. The package recited in claim 22, wherein the at least one surface of the integrated heat spreader connected to the heat sink only becomes flat when either absorbing heat or grasped for mounting.

25. The package recited in claim 22, wherein the at least one surface of the integrated heat spreader connected to the heat sink is thicker at points closely associated with hotspots on the die.